

**NOVEL TAXA OF *TRICHOGRAMMA* FROM THE
NEW WORLD TROPICS AND AUSTRALIA
(HYMENOPTERA: TRICHOGRAMMATIDAE)**

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Abstract.—Three new species of *Trichogramma* from the New World tropics and one new species from Australia are described. These taxa differ from all congeners by the unjoined funicular and club segments of the male antenna, and the two-segmented maxillary palp. The New World species also are distinguished by the unique structure of the aedeagus. All four new species are retained tentatively within the nominate subgenus of *Trichogramma*. Their relationship to other species of the genus is discussed.

The study of recent Trichogrammatidae collections from the Neotropics and Australia has revealed four new species of *Trichogramma* which extend considerably the known anatomical variation in this cosmopolitan genus of insect egg parasitoids. These species share certain derived features that define *Trichogramma*, but are believed to represent primitive lineages that diverged before the attainment of fusion of the antennal flagellomeres in males. Pending an evaluation of phylogenetic relationships in the genus these taxa are tentatively placed in two informal species groups within the nominate subgenus, the Lachesis and Primaevum groups.

In this paper the new species groups and included species are described. These taxa are compared to other elements of *Trichogramma*, and their phylogenetic position and taxonomic treatment are discussed. Also, terms are utilized for the male genitalia that conform to those adopted for other genera of Trichogrammatidae.

TERMINOLOGY

The male genitalia comprise the most important character complex in *Trichogramma*. Species identifications were virtually impossible prior to Nagarkatti and Nagaraja (1968) in which this rich source of variation was first considered. Because of questions of homology, however, these authors introduced a unique terminology for certain genitalic structures in *Trichogramma* and *Trichogrammatoidea* (Nagarkatti and Nagaraja, 1968, 1971, 1977; Nagaraja, 1978). This was adopted by other authors (e.g., Ertle and Davis, 1975; Pinto and Oatman, 1985; Pinto et al., 1978, 1989; Schulten and Feijen, 1978, 1982; Vincent and Goodpasture, 1986; Voegelé and Pintureau, 1982) and became standard in studies of both genera. In contrast, Viggiani (1971), and Viggiani and Laudonia (1989) utilized a terminology for all Trichogrammatidae which stems from generalized works on Hymenoptera genitalia (Snodgrass, 1941, 1957; Domenichini, 1953). This is largely employed here, and it is suggested that other investigators working with *Trichogramma* and *Trichogrammatoidea* also adopt these more conventional terms. Maintaining two distinct terminologies within the family is awkward and potentially confusing.

The descriptions of male genitalia in the new species treatments, for the most part, are consistent with Viggiani and Laudonia (1989). The structures, acronyms (also see Figs. 10, 11, 13) and, where appropriate, counterparts (in brackets) used by Nagarkatti and Nagaraja (1968, 1971) are as follows:

Genital capsule (GC)—the entire genitalia except the aedeagus; phallobase (PB) [= gonobase, GB]; dorsal aperture of the phallobase (DA); dorsal lamina (DLA) [=dorsal expansion of gonobase, DEG & DEGB]; parameres (PM) [=gonoforceps, GF]; volsellar digiti (VS) [=chelate structures, CS]; intervolsellar process (IVP) [=median ventral projection, MVP]; intervolsellar bridge (IB)—surface between the base of the volsellae, including the IVP; ventral ridge (VR) [=chitinized ridge, CR]; ventral processes (VP)—paired papillae or tubercle-like structures lateral to the ventral ridge, at or near base of IVP [=lateral tubercles (Nagaraja, 1978), and paired ventral protuberances (Nagaraja and Nagarkatti, 1969)]. GC, IB, VR and VP were not considered by Viggiani and Laudonia (1989).

Acronyms terminating with L, D or W signal length, distance and width measurements, respectively. Included are HTL (hind tibial length), FWW (maximum forewing width), FWL (forewing length, taken from tegula to wing apex), GW (maximum width of genital capsule), GL (maximum length of genital capsule), AD (apical distance of genital capsule: from base of volsellae and IVP to apex of PM), BD (basal distance of genital capsule: GL minus AD, or distance from base of volsellae and IVP to base of genital capsule), AL (length of aedeagus, including apodemes), OL (maximum length of ovipositor).

Acronyms for two types of sensilla on the antenna are BCPS (=basiconic peg sensilla), and PS (=linear, placoid sensilla). Sensilla formulae in descriptions refer to these sensilla on each of the funicular and club segments. Funicular and club segments are referred to as F1–2, and C1–3, respectively.

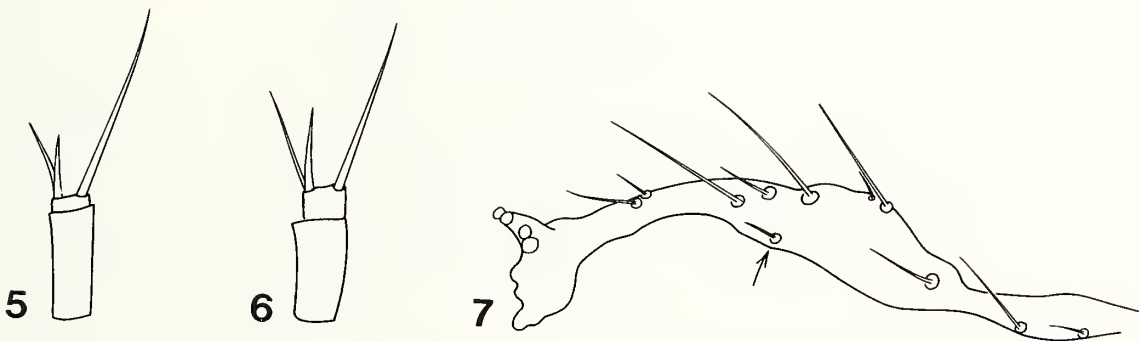
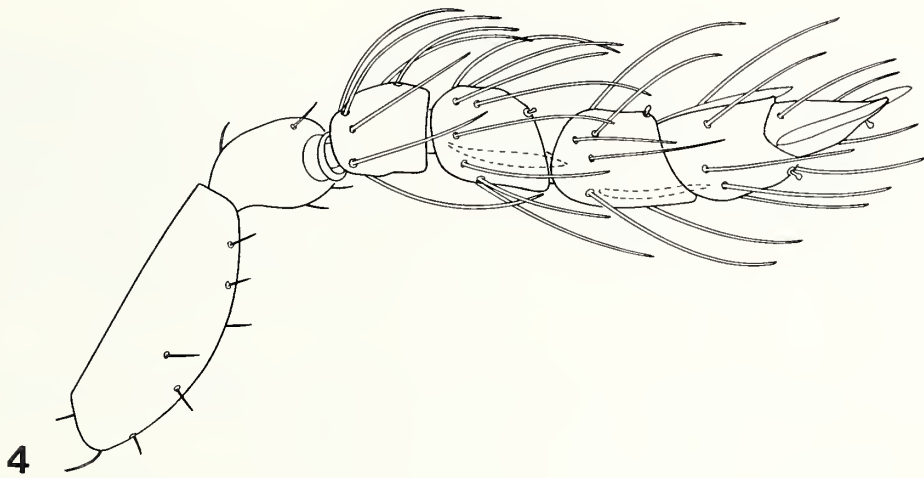
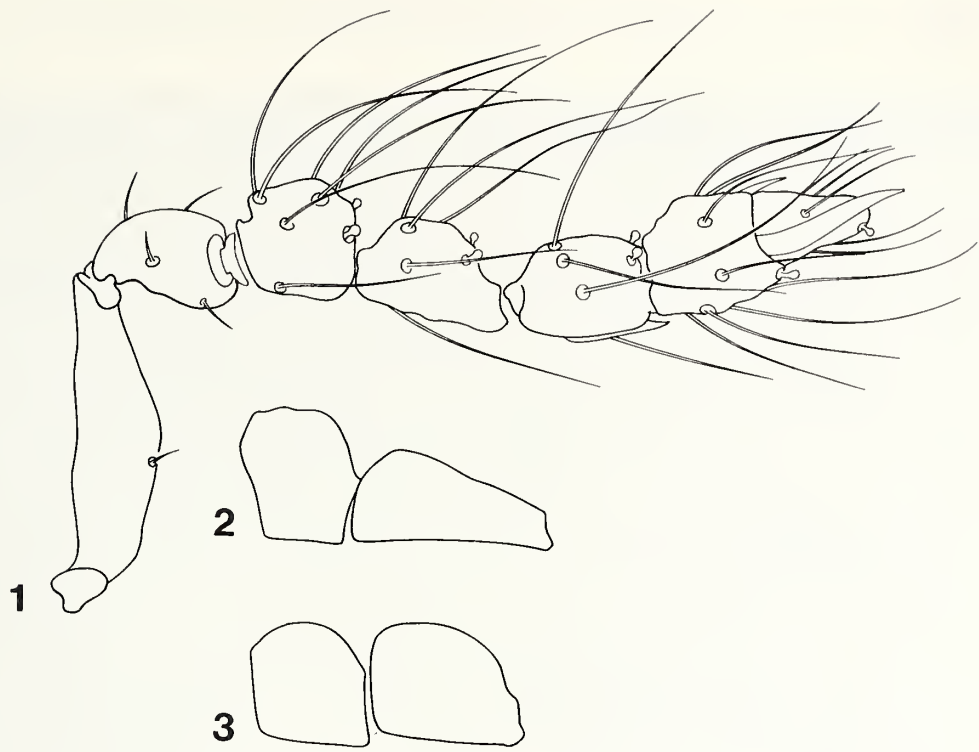
Antennal, forewing and genitalic features referred to in the descriptions are illustrated below. Hindwing and scutellar features are illustrated in Pinto et al. (1978).

DEFINING FEATURES OF *TRICHOGRAMMA*

Trichogramma is easily distinguished from other Trichogrammatidae. The forewing is relatively broad with distinct vein tracks including an RS_1 ; the stigmal vein is well developed but not abruptly delimited from the marginal vein—instead it gradually curves into the latter, resulting in the characteristic “sigmoid” venation (Fig. 7). The female antenna consists of two funicular segments and a single club segment. The male genitalia have a dorsal lamina and the aedeagus is not fused to the genital capsule.

Trichogramma is believed to be closest to *Trichogrammatoidea* (Nagarkatti and Nagaraja, 1977; Nagaraja, 1978). They share the “sigmoid” venation in the forewings, the antennal structure of females is identical, and they have similar male genitalia. Although similar, *Trichogrammatoidea* lacks the RS_1 vein track in the forewing as well as the dorsal lamina of the genital capsule. The latter feature, so far as known, is unique in the family (see Viggiani 1971, 1984) and is the derived feature defining *Trichogramma*.

Until now, *Trichogramma* was also distinguished from *Trichogrammatoidea* and other genera by its male antenna. In *Trichogrammatoidea* the two funicular and three club segments are distinct. In virtually all species of *Trichogramma*, these five seg-



Figs. 1–7. Male antennae, maxillary palp, and forewing venation in the *Lachesis* and *Primaevum* groups of *Trichogramma*. 1. *Trichogramma lachesis*, antenna (left). 2. *Trichogramma clotho*, funicle. 3. *Trichogramma atropos*, funicle. 4. *Trichogramma primaevum*, antenna (left). 5. *Trichogramma lachesis*, maxillary palp. 6. *Trichogramma clotho*, maxillary palp. 7. *Trichogramma lachesis*, forewing venation (arrow points to submarginal seta).

ments, as well as the second anellus, are consolidated into a single, elongate segment. The only previous exceptions known were species in the subgenus *Trichogrammanza* Carver which has the two funicular (but not the club) segments unjoined (Carver, 1978; Oatman and Pinto, 1987).

The four new species described below necessitate a modest redefinition of *Trichogramma*. In these species, forewing venation and vein tracks, and male genital structure (with the dorsal lamina) are typical of the genus. However, unlike all congeners, the two funicular and three club segments are unjoined as in *Trichogrammatoidea* (Figs. 1, 4). In addition, the maxillary palp is two-segmented (Figs. 5, 6). In all congeners, as well as in *Trichogrammatoidea*, the palp is one-segmented. It should be noted that although the number of flagellomeres in these new species agrees with *Trichogrammatoidea*, antennal structure (e.g., shape, sensilla type and number) does not. Instead, in all respects, their antennae more closely resemble other trichogrammatine genera, particularly *Australufens* and *Trichogrammatomyia*. For example, the club is compact, suboval in shape, and C3 is subconical and pointed apically. In *Trichogrammatoidea* the club is more elongate, the segments are more loosely joined, and C3 is rounded apically (Doutt and Viggiani, 1968). The phylogenetic implications of these new species and the justification for placing them in species groups in the nominate subgenus is discussed following the descriptions.

LACHESIS GROUP

As in other *Trichogramma* except as follows: Male antenna with two funicular and three club segments; C3 subconical, pointed apically; funicular segments lacking linear PS. Aedeagus (Fig. 12) apparently bilobed with phallosome more extensive than in congeners, extending a distance from apex along ventral surface; aedeagus longer than genital capsule. Maxillary palp two-segmented (Figs. 5, 6). Forewing with a seta near posterior border of marginal vein (Fig. 7). Hindwing without a posterior vein track.

Notes. The Lachesis Group contains three species from Central America and northern South America. The female is indistinguishable from congeneric females except for the structure of the maxillary palp, and wing setation.

Etymology of specific names. After the three Fates of Greek mythology.

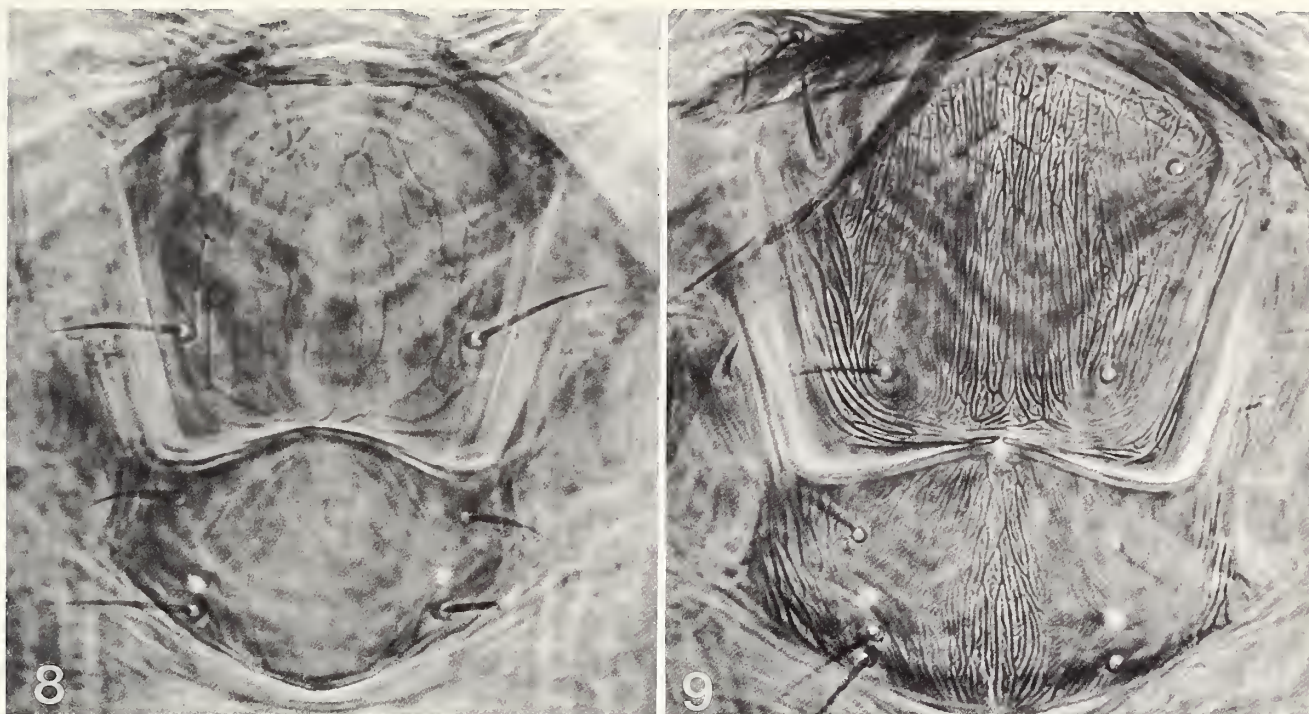
Trichogramma lachesis, new species

Figs. 1, 5, 7, 10–12

Description based on two males and one female, slide-mounted in Canada balsam. Unless referring to the unique female, quantitative data are means with an *n* of 2 or 3, as appropriate; range is reported if specimens differ considerably.

Diagnosis. *Trichogramma lachesis* is distinguished from other Lachesis Group species by the very broad ventral ridge (VR) and the absence of an intervalsellar process (IVP) (Fig. 11).

Description. Color light yellow brown; 0.47 mm in length; HTL = 0.12–0.13 mm (males), 0.14 mm (female). Maxillary palp with segment II short, obsolescent (Fig. 5). Forewing broad, 0.20 mm; FWW/FWL = 0.57; longest fringe setae 0.16 FWW; relatively few setae between major vein tracks, 8–13 between 4th and 5th tracks. Hindwing without anterior or posterior tracks, but two small, widely spaced setae



Figs. 8–9. Thoracic microsculpturing in the Lachesis Group of *Trichogramma*. 8. *Trichogramma atropos*. 9. *Trichogramma clotho*.

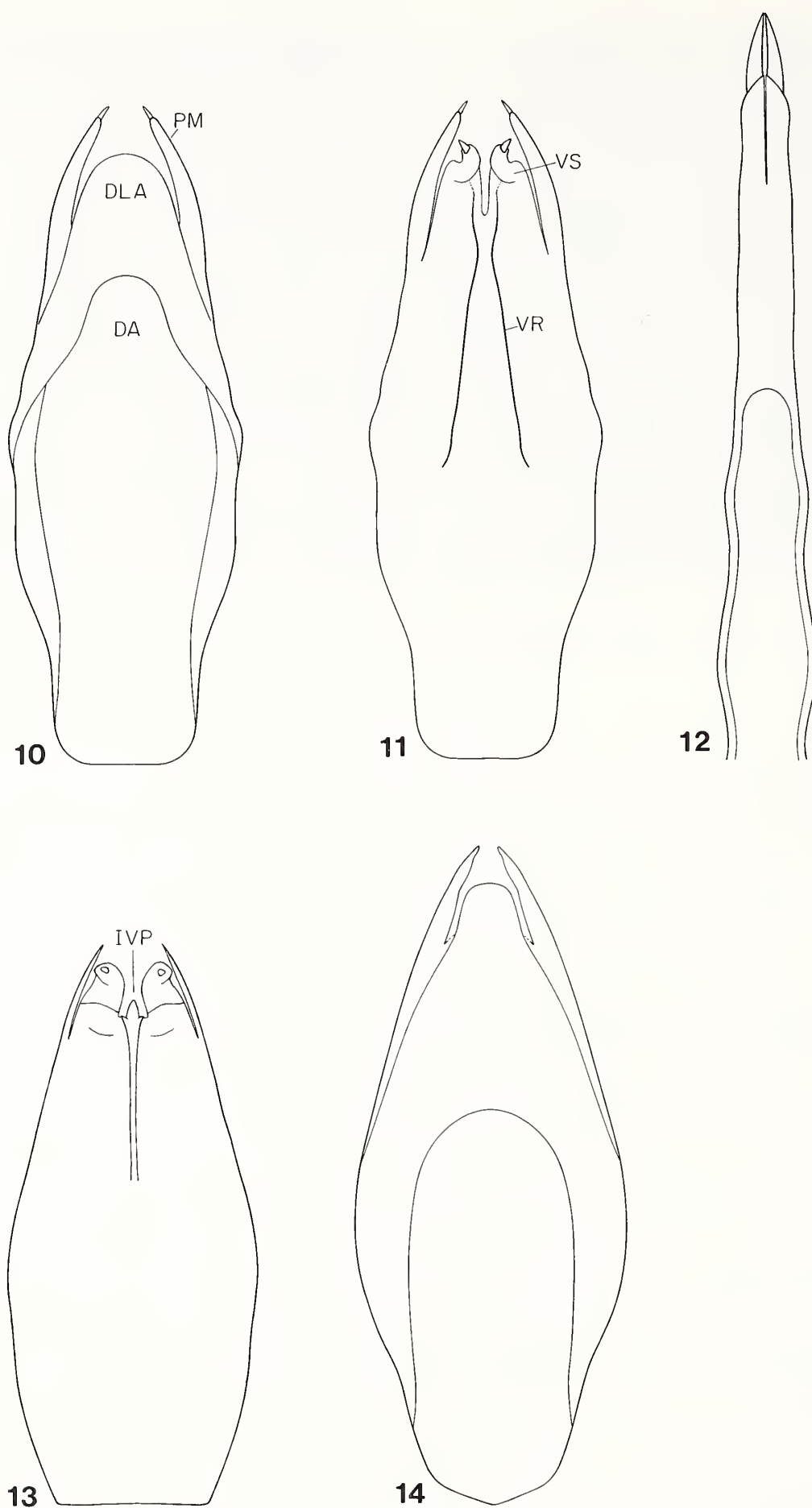
slightly posterior to basal half of middle track may represent posterior track setae. Mesoscutum and scutellum smooth, microsculpturing indistinct; scutellum with anterior pair of setae elongate, stout, ca. 0.6 length of posterior pair.

Male. Antenna (Fig. 1) with funicle 0.70 length of club, subequal to length of scape; F1 subquadrate, apical socket acentrically positioned; F2 1.6 as long as wide, 1.3 as long as F1, asymmetrically tapered from middle to relatively narrow apex, only slightly narrower than F1 at basal half; length of club segments 12:14:11, respectively; C2 slightly wider than C1; C3 narrower, subconical; longest setae on flagellum 2.3–2.7 width of F1; BCPS large, bulbous, formula 2-2-2-1-1; PS extending considerably beyond apex of segments, conspicuously so on C3, formula 0-0-1-1-2.

Genital capsule (Figs. 10, 11) 0.37 as wide as long, tapering moderately from widest point to apex; PM evenly curved, convergent to apex, appendiculate at apex; AD short, only 0.16 GL; DA large, its length 0.72 GL; DLA not lobed or notched at base, extremely broad its entire length, width of posterior extension subequal to that across parameres, broadly arcuate at apex, extending to apical $\frac{2}{5}$ of AD; VS abruptly produced ventromedially at apical half, very narrowly separated from one another, extending slightly beyond apex of DLA, occupying ca. 0.7 AD; IVP absent; IB narrow; VR conspicuous, extremely broad, elongate, occupying ca. $\frac{1}{2}$ BD; VP not visible. Aedeagus length (Fig. 12) 1.10 GL, 0.90 HTL; apodemes 0.51 AL; aedeagus widest at apodemes.

Female. Antenna with F1 and F2 subquadrate, about as broad as long, each with 1 BCPS on dorsal surface; club length subequal to length of scape, with two BCPS on dorsal surface (at basal and apical $\frac{1}{4}$, respectively) and five PS. Ovipositor moderately long, OL/HTL = 1.12.

Types. Male holotype. COSTA RICA. *Guanacaste*: Santa Rosa National Park, “Hacienda 3-0”; v-24/vi-14-1986. Allotype female, same data as holotype. Paratype



Figs. 10–14. Male genitalia in the Lachesis Group of *Trichogramma*. 10. *Trichogramma lachesis*, genital capsule (dorsal) (VS partially visible in dorsal view but not shown). 11. *Trichogramma lachesis*, genital capsule (ventral). 12. *Trichogramma lachesis*, aedeagus (ventral),

male, same data as holotype except "Hacienda 2-C"; i-31/ii-21-1987. The types are deposited as follows: holotype and allotype—United States National Museum; paratype—University of California, Riverside.

Santa Rosa is the former name of Guanacaste National Park. According to information received from Ian Gauld and Paul Hanson (in litt.) the types were collected in two different Malaise traps (one in shade, the other in a clearing) placed on the plateau (250–300 m) immediately west of park headquarters in young scrubby woodland.

Notes. The female allotype was collected with the holotype. Their association is based on correspondence of all comparable characters including color, structure of the maxillary palp, scutellar setal length, thoracic sculpturing, and hindwing setation.

Trichogramma clotho, new species

Figs. 2, 6, 9, 13

Description based on the unique male holotype (slide-mounted in balsam).

Diagnosis. *Trichogramma clotho* is distinguished from other *Lachesis* Group species by the distinctive rugulose microsculpturing on the thorax (Fig. 9), and the more elongate and apically tapered second funicular segment (Fig. 2).

Description. Color dark brown; 0.55 mm in length; HTL = 0.14 mm. Forewing broad, 0.23 mm in width; FWW/FWL = 0.57; longest fringe setae 0.15 maximum wing width; setation on disk similar to *lachesis*, 5 setae between 4th and 5th tracks, RS₁ consisting of only 2 setae. Maxillary palp (Fig. 6) with segment II longer, more distinct than in *lachesis*. Hindwing without anterior and posterior tracks. Mesoscutum and scutellum with distinct, rugulose microsculpturing (Fig. 9); scutellum with anterior pair of setae elongate, stout, ca. 0.6 length of posterior pair (type has a supernumerary posterior seta on left side).

Antenna with funicle 0.70 length of club and subequal to length of scape; F1 subrectangular, 0.8 as long as wide, apical socket acentrically positioned; F2 elongate, considerably narrower and longer than F1 (Fig. 2), strongly asymmetrically tapered from basal 1/3 to apex, 2.3 as long as wide, 1.9 as long as F1; length of club segments 14:14:18, respectively; C2 slightly wider than C1, C3 apparently considerably narrower and linear (partially collapsed in type); longest setae on flagellum 3.0 width of F1; BCPS shape and formula as in *lachesis*; PS extending considerably beyond apex of segments, formula 0-0-0-1-2.

Genital capsule (Fig. 13) 0.45 as wide as long; AD short, 0.15 GL; PM straight, narrow, convergent, apparently not appendiculate; DA large, its length 0.69 GL; DLA as in *lachesis*, extending 0.4 length of AD; VS slightly less strongly produced ventromedially than in *lachesis*, occupying ca. 0.8 AD; IVP present, moderately long, robust, subtriangular, extending 0.3 AD; IB wider, slightly greater than basal width of IVP; VR narrow, occupying 0.3 BD; VP short, slightly protuberant, at base of

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showing bilobed structure and elongate phallosome at apex. 13. *Trichogramma clotho*, genital capsule (ventral). 14. *Trichogramma atropos*, genital capsule (dorsal) (VS partially visible in dorsal view but not shown). DA = dorsal aperture of phallobase; DLA = dorsal lamina; IVP = intervolsellar process; PM = parameres; VR = ventral ridge; VS = volsellar digiti.

IVP. Aedeagus length 1.21 GL; AL/HTL = 0.79; apodemes occupying 0.49 AL, aedeagus not wider at apodemes.

Female. Unknown.

Type. Holotype male. COSTA RICA. *Puntarenas*: Golfo Dulce, 13 km S Rincon, 10 m elev.; ii/iii-1989; Malaise trap; P. Hanson coll. Deposited in the United States National Museum.

***Trichogramma atropos*, new species**

Figs. 3, 8, 14

Description based on the unique male holotype, slide-mounted in Canada balsam.

Diagnosis. *Trichogramma atropos* is distinguished from other *Lachesis* Group species by the subquadrate second funicular segment (Fig. 3), the presence of an incomplete anterior vein track in the hindwing, and the triangular posterior extension of the dorsal lamina (DLA) (Fig. 14).

Description. Color yellow brown; 0.48 mm in length; HTL = 0.15 mm. Maxillary palp II as in *lachesis*. Forewing broad, 0.20 mm in width, FWW/FWL = 0.54; longest fringe setae 0.19 wing width; disk moderately densely setate, with 7 linearly arranged setae between 4th and 5th tracks. Hindwing with anterior track of 3 setae; posterior track absent. Mesoscutum and scutellum smooth, microsculpturing indistinct; scutellum with anterior pair of setae elongate, stout, ca. 0.7 length of posterior pair (Fig. 8).

Antenna with funicle 0.70 length of club, subequal to length of scape; F1 subquadrate; F2 (Fig. 3) 1.2 as long as wide, 1.2 as long as F1, asymmetrically tapered only at apex of segment; length of club segments 12:12:11, respectively; C2 slightly wider than C1; C3 considerably narrower, subconical; flagellar setae relatively short and stout, abruptly tapered at apex, longest setae 1.8 width of F1; BCPS large, bulbous, formula 2-2-2-2-1; PS formula 0-0-0-1-2.

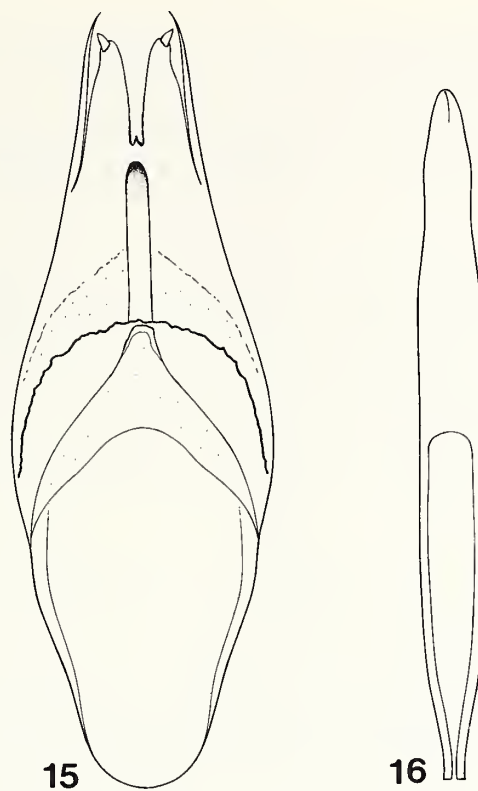
Genital capsule (Fig. 14) 0.43 as wide as long, gradually tapering from widest aspect to apex; PM relatively straight, evenly convergent to apex, apparently not appendiculate; AD 0.27 GL; DA relatively narrow, its length 0.58 GL; DLA not obviously notched or lobed at base, its posterior extension broadly subtriangular, tapering evenly from base to bluntly rounded apex, extending to apex of VS; VS asymmetrically narrowed apically, produced ventromedially, occupying 0.70 AD; IVP present but inconspicuous, short, linear, occupying only 0.1 AD; IB narrow; VR difficult to discern in type, apparently narrow and relatively short; VP not protuberant, positioned considerably basal to IVP. Aedeagus length 1.11 GL, 0.70 HTL, apodemes 0.41 AL; aedeagus not wider at apodemes.

Female. Unknown.

Type. Holotype male. VENEZUELA. *Merida*: La Montaña Station, 2,435 m elev.; iv-3/13-1988; Malaise trap; A. T. Finnamore & C. E. Baxfield, collrs. Type deposited in United States National Museum.

PRIMAEVUM GROUP

As in the *Lachesis* Group except as follows: F1 of male antenna with a linear PS. Aedeagus not bilobed, phallotreme restricted to apex. Hindwing with an incomplete but distinct posterior vein track.



Figs. 15–16. Male genitalia in the Primaevum Group of *Trichogramma*. 15. *Trichogramma primaevum*, genital capsule (dorsal). 16. *Trichogramma primaevum*, aedeagus (ventral).

Notes. This group includes a single species from Queensland, Australia. The female is unknown. Male antennal segmentation, maxillary palp structure, and marginal vein setation are as in the Lachesis Group. Aedeagus structure, however, is as in all other *Trichogramma*.

***Trichogramma primaevum*, new species**

Figs. 4, 15, 16

Description based on the unique male holotype, slide mounted in Canada balsam.

Diagnosis. *Trichogramma primaevum* is distinguished from members of the Lachesis Group by the simple aedeagus and its shorter phallotreme (Fig. 16), and by the presence of a placoid sensillum (PS) on the second funicular segment of males. The segmented male club separates the species from all other congeners.

Description. Color yellow brown, legs and abdomen lighter than rest of body; 0.60 mm in length; HTL = 0.15 mm. Maxillary palp with a short second segment. Forewing broad, 0.26 mm wide; FWW/FWL = 0.60; stigmal vein relatively short, robust, with a slightly constricted neck; fringe unusually short, longest setae only 0.06 FWW; 18 setae between 4th and 5th tracks. Hindwing with posterior track of 5 setae extending 0.45 distance from hamuli to apex; anterior track complete to apex. Mesoscutum and scutellum relatively smooth, microsculpturing indistinct; scutellum with posterior pair of setae short (0.016 mm long), only ca. half the length of those in congeners; anterior setae slightly shorter.

Antenna (Fig. 4) with funicle 0.58 length of club, 0.73 length of scape; scape somewhat broader than in congeners; F1 subquadrate, apical socket not acentrically positioned; F2 1.4 as long as wide, 1.4 as long as F1, asymmetrically tapered at apex;

Table 1. Characters distinguishing species of the *Lachesis* and *Primaevum* groups of *Trichogramma*.

Characters ^{1,2}	Species			
	<i>lachesis</i>	<i>clotho</i>	<i>atropos</i>	<i>primaevum</i>
1.	0	1	0	0
2.	0	0	0	1
3.	0	0	1	2
4.	1	2	0	0
5.	0	1	0	0
6.	0	0	0	1
7.	1	1	1	0
8.	1	1	1	0
9.	1	0	0	0
10.	0	0	1	2
11.	0	2	1	1
12.	1	0	0	0
13.	1	1	1	0

¹ Characters: 1. Dorsum of thorax smooth, with indistinct microsculpturing (0) (Fig. 8); with distinct, rugulose microsculpturing (1) (Fig. 9). 2. Hindwing with posterior vein track absent (0), present (1). 3. Hindwing with anterior vein track absent (0), incomplete (1), complete to apex (2). 4. F2 of male antenna slightly (0) (Fig. 3), moderately (1) (Fig. 1), strongly (2) (Fig. 2), tapered to apex. 5. Length of F2 of male antenna less than 1.5 (0) (Fig. 1), or almost 2.0 (1) (Fig. 2), that of F1. 6. F2 of male antenna without (0) (Fig. 1), or with (1), a PS (Fig. 4). 7. AL shorter (0) (Figs. 15, 16), or longer (1) (Figs. 11, 12), than GC. 8. Aedeagus not bilobed at apex, phallotreme restricted to apex (0) (Fig. 16); aedeagus bilobed apically, phallotreme more extensive, extending from apex onto ventral surface (1) (Fig. 12). 9. PM appendiculate apically (1) (Fig. 10), or not (0) (Fig. 13). 10. Posterior extension of DLA broad, ligulate (0) (Fig. 10); broad, triangular (1) (Fig. 14); extremely narrow, filiform (2) (Fig. 15). 11. IVP absent (0) (Fig. 11), minute (1) (Fig. 15), well developed (2) (Fig. 13). 12. VR narrow (0) (Fig. 13), very broad (1) (Fig. 11). 13. VS relatively straight, unmodified (0) (Fig. 15); contorted, produced ventromedially (1) (Figs. 11, 13).

² Character codes are ordered phenetically.

maximum length of club segments subequal; C1, C2 subequal in width, C3 considerably narrower, subconical; flagellar setae relatively short and stout, abruptly tapered at apex, longest setae 1.67 width of F1; BCPS relatively small, subglobose, difficult to discern in type, formula apparently 1-2-2-1-1; PS formula 0-1-1-1-2.

Hind tibia atypical for genus, broadly notched dorsoapically.

Genital capsule (Fig. 15) 0.34 as wide as long, strongly, evenly tapered from widest point to apex and to base; PM narrow, slightly curved at apex only, not appendiculate; AD 0.17 GL; DA smaller than in *Lachesis* Group, its length 0.45 GL; DLA unique: base of structure consists of a broadly and lightly sclerotized area intermediate to a basal and an apical membranous region, basal membranous area subtriangular and well defined, apical area poorly differentiated; posterior extension of DLA uniformly very narrow, subfiliform, curving ventrally, extending from apex of subtriangular membranous area to near base of volsellae; DLA not notched or lobed at base; VS straight elongate, narrowly separated, occupying ca. 0.90 AD; IVP minute, subtriangular; IB narrow, no broader than basal width of IVP; VR narrow, elongate, occupying 0.43 BD; VP not protuberant, extremely basal in position, near midpoint of VR. Aedeagus length (Fig. 16) 0.93 GL, 0.82 HTL; apodemes 0.47 AL.

Female. Unknown.

Type. Holotype male. AUSTRALIA. *Queensland:* Westwood, 9.6 km NE, on Hwy. 66 at Valentine Creek; iv-12-1988; screen sweeping; G. Gordh & J. D. Pinto, collrs. Type deposited in the Queensland Museum, Brisbane, Australia.

Etymology. The specific name *primaevum* is a Latin word for young or early (primeval).

Notes. *T. primaevum* is similar to species of the Lachesis Group only in antennal segmentation, the two-segmented maxillary palp and the presence of a submarginal seta on the marginal vein. Hindwing setation, aedeagus and genital capsule structure, scutellar setal length, and the PS formula on the antenna all differ.

The PS on F2 of the type's left antenna is oriented longitudinally as is normal in Trichogrammatidae; its counterpart on the right antenna is oriented transversely.

DIAGNOSES AND SPECIES RELATIONSHIPS

The four new species share characters absent in all other *Trichogramma*. The male antenna has both the funicular and club segments unjoined, the maxillary palp is two-segmented, and the marginal vein has a seta distinctly behind its anterior border. Species differences are summarized in Table 1. *Trichogramma primaevum* is clearly differentiated from the Lachesis Group. Its relationship to this group and other components of the genus cannot yet be resolved. The phenetically similar species of the Lachesis Group are tied by aedeagal structure and hindwing setation. Species relationships within the group also are questionable. The more highly modified F1 in *lachesis* and *clotho* suggests that they are more closely related than either is to *atropos*. The occurrence of an IVP in *clotho* and *atropos*, and not in *lachesis* is in contradiction, but only if the absence of the IVP is plesiomorphic. The distinctive thoracic microsculpturing in *T. clotho* separates it from related species and all other congeners (cf. Figs. 8, 9).

DISCUSSION

Trichogramma currently is divided into two subgenera, the nominate subgenus and *Trichogrammanza*. *Trichogrammanza* was described by Carver (1978) based on male antennal segmentation (two distinct funicular segments, single club segment). It includes three Australian species and was recently reviewed by Oatman and Pinto (1987). The nominate subgenus, world-wide in distribution and with over 160 named species, is divided into a variable number of species groups depending on authority (Nagarkatti and Nagaraja, 1977; Voegelé and Pintureau, 1982; Viggiani and Laudonia, 1989).

The differences between the species of the Lachesis and Primaevum groups, and congeners are of a greater magnitude than between the nominate subgenus and *Trichogrammanza*, and would also justify subgeneric, perhaps even generic, treatment on phenetic grounds. Thus, the placement of these new taxa within the nominate subgenus is somewhat discordant to the current classification.

This conservative approach is proposed until a better understanding of phylogenetic relationships in the genus is gained. Phylogenetic questions concern the relationship of *Trichogrammanza* to the nominate subgenus, and the relationship of the Lachesis and Primaevum groups to one another and to congeners.

With regard to *Trichogrammanza*, male antennal segmentation prompted Nagarkatti and Nagaraja (1977) to consider the taxon intermediate to *Trichogrammatoidea* and *Trichogramma* (*Trichogramma*). However there is reason to suggest that, rather than representing the sister taxon of the nominate subgenus, *Trichogrammanza* is of more recent origin, and is actually derived from an ancestor with complete antennal ankylosis in males. The presence of rare males with typical *Trichogramma* (*Trichogramma*) antennae (completely fused flagellar segments) in an isofemale-derived laboratory culture of *T. (Trichogrammanza) funiculatum* Carver (unpubl. data), suggests that the unjoined funicular segments may not be plesiomorphic, but a reversal instead. Also, the male genitalia of the three species of *Trichogrammanza* are not distinctive in any way but instead are similar to those of the Palearctic *T. (Trichogramma) principium* Sugonjaev and Sorokina, and relatives (Oatman and Pinto, 1987). The possibility that the latter assemblage represents the sister taxon of *Trichogrammanza* warrants investigation. Of course, subgeneric treatment for *Trichogrammanza* could not be supported on cladistic grounds if such a relationship to this or any other component of the nominate subgenus is shown.

In my opinion the *Lachesis* and *Primaevum* groups do represent primitive lineages, basal to all other *Trichogramma*. This is suggested by male antennal structure which is remarkably similar to that in other genera of Trichogrammatini, namely *Australufens* and *Trichogrammatomyia* (cf. figs. 1 and 4 with figs. 3D & 57B in Douth and Viggiani, 1968), and by the two-segmented maxillary palp. Because these similarities presumably are plesiomorphic they do not argue for the *Lachesis* and *Primaevum* groups representing a single lineage. The bilobed aedeagus and its elongate apicoventral phallotreme in the *Lachesis* Group are unique and perhaps justify isolation at the subgeneric level. The former trait probably is derived. The ventral extension of the phallotreme, however, was considered primitive in Hymenoptera by Snodgrass (1941, 1957). A detailed comparison of aedeagal structure in *Trichogramma* is required before a more definitive estimate of polarity of these characters can be given. Unfortunately, the paucity of *Lachesis* Group specimens prevents this. In any case, formal treatment of the *Lachesis* Group would still leave the position of *T. primaevum* unsettled. Although placing both groups in the nominate subgenus is not entirely satisfactory, it seems preferable to erecting one or two inadequately supported subgenera.

ACKNOWLEDGMENTS

Specimens were mounted on slides by Rob Velten; Linda Bobbitt assisted with Figs. 1–7, 10–12, and 14–16; Robert Orth prepared Fig. 13. Gary Platner helped with Figs. 8 and 9, and the preparation of plates.

This study was supported by Grant BSR-9006177 from the National Science Foundation.

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Received 24 September 1991; accepted 22 April 1992.